

Claims

1. A plasma assisted reactor for the simultaneous  
removal of nitrogen oxides and carbonaceous combustion  
5 products from exhaust gases, comprising a reactor chamber  
(11) adapted to be connected into a gas exhaust system, a  
gas permeable bed of an active material (12) contained  
within the reactor (11), means (7, 13, 14, 6, 8) for  
causing exhaust gases to pass through the bed of active  
10 material (12), and means (6, 9, 10, 14, 5) for exciting  
into a plasma state exhaust gases passing through the bed  
of active material (12), characterised in that the bed of  
active material (12) includes a mixed metal oxide  
material having the general formula  $A_2 \cdot x A^1_x B^1_y O_4$ .
- 15 2. A plasma assisted reactor as claimed in claim 1 for  
the simultaneous removal of nitrogen oxides and  
carbonaceous combustion products from internal combustion  
engine exhaust gases, further characterised in that the  
20 reactor chamber (1) is adapted to be connected into the  
exhaust system of an internal combustion engine.
3. A reactor according to claim 2 characterised in that  
the components A  $A^1$  of the mixed metal oxide material are  
25 selected from the group of elements comprising La, Sr, Ba  
and K and the components B  $B^1$  of the mixed metal oxide  
material are selected from the group of elements  
comprising Co, Mn, Cr, Cu, Mg and V.

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4. A reactor according to claim 3 characterised in that the mixed metal oxide is  $\text{La}_2\text{CuO}_4$ .
5. A reactor according to claim 3 characterised in that the mixed metal oxide active material 12 is selected from the group comprising  $\text{La}_{1.8}\text{Ba}_{0.2}\text{CuO}_4$ ;  $\text{La}_{1.7}\text{Sr}_{0.3}\text{Cu}_{0.9}\text{V}_{0.1}\text{O}_4$ ;  $\text{La}_{1.9}\text{K}_{0.1}\text{Cu}_{0.7}\text{Cr}_{0.3}\text{O}_4$ ;  $\text{La}_{1.8}\text{Ba}_{0.2}\text{Cr}_{0.7}\text{V}_{0.3}\text{O}_4$  and  $\text{La}_{1.9}\text{K}_{0.1}\text{Cu}_{0.95}\text{V}_{0.05}\text{O}_4$ .
- 10 6. A reactor according to claim 4 characterised in that the mixed metal oxide is  $\text{La}_{1.9}\text{K}_{0.1}\text{Cu}_{0.95}\text{V}_{0.05}\text{O}_4$ .
7. A reactor according to any of claims 2 to 6 characterised in that the bed (1) of active material is 15 in the form of an agglomeration of bodies (12) of the active material in the form of spheres, regularly or irregularly shaped pellets or hollow extrudates.
8. A reactor according to claim 7 characterised in that 20 the bodies (12) of active material include a ceramic binder material.
9. A reactor according to claim 8 wherein the ceramic binder material comprises silica, titania or alumina or 25 any combination thereof.
10. A reactor according to claim 8 or claim 9 wherein the ceramic binder material is present in the proportion of about three weight per cent.
- 30 11. A reactor according to any of claims 8 to 10 wherein the bodies (12) of active material are in the form of spheres.

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12. A reactor according to any preceding claim characterised in that the means (5, 6, 9, 10, 14) for exciting the exhaust gases into the plasma state is separate from the bed (11) of mixed metal oxide active material (12) and precedes the bed (11) of active mixed metal oxide material (12).

13. A reactor according to any of claims 1 to 11 characterised in that the means for exciting the gases to the plasma state comprises at least two electrodes (6, 14) in contact with the bed (11) of active material and means (9, 10) for applying to the electrode a potential difference sufficient to excite the exhaust gases to a plasma state in the interstices of the bed (11) of active material.

14. A reactor according to claim 13 further characterised in that a dielectric barrier is provided between the said two electrodes (6, 14).

15. A reactor according to claim 14 further characterised in that the dielectric barrier is provided in the form of a coating on the surface of one or both of the said two electrodes (6, 14).

16. A reactor according to claim 13, further characterised in that a material of high dielectric permittivity is incorporated in the bed of active material.

17. A reactor according to any of claims 1 to 12 characterised in that the bed of active material (12) is in the form of a gas permeable monolith.

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